Listing of Claims:

1. (Currently Amended) A method of operating a thermal processing system comprising:

positioning a wafer for processing by the thermal processing system on a hotplate comprising a plurality of zones;

creating a dynamic thermal model of the thermal processing system;

establishing a plurality of intelligent setpoints using the dynamic thermal model of the thermal processing system, wherein each of the plurality of intelligent setpoints is associated with a corresponding one of the plurality of zones; and

reducing critical dimension (CD) variation across the wafer, profile variation across the wafer, or uniformity variation across the wafer, or a combination of two or more thereof by controlling an actual temperature of each of the plurality of zones of the hotplate using a corresponding one of the plurality of intelligent setpoints ~~to establish a substantially uniform temperature profile across the wafer~~ during processing.

2. (Original) The method of claim 1 further comprising:

receiving feed forward data;

estimating wafer stresses using the feed forward data;

creating a thermal model for a gap between the wafer and the hotplate, wherein a thermal response for the gap is predicted based on the estimated wafer stresses; and

incorporating the thermal model for the gap into the dynamic thermal model of the system.

3. (Currently Amended) The method of claim 2 wherein wafer stresses are estimated using refractive index (n) data, or ~~and~~ extinction coefficient (k) data, or a combination thereof extracted from the feed forward data.

4. (Currently Amended) The method of claim 2 wherein the feed forward data comprises layer information including ~~at least one of~~ the number of layers, layer position, layer composition, layer uniformity, layer density, ~~and~~ or layer thickness, or a combination of two or more thereof.

5. (Currently Amended) The method of claim 2 wherein the feed forward data includes ~~at least one of~~ critical dimension (CD) data for the wafer, profile data for the wafer, ~~and~~ or uniformity data for the wafer, or a combination of two or more thereof.

6. (Currently Amended) The method of claim 2 wherein the feed forward data includes ~~at least one of~~ critical dimension (CD) data for a plurality of locations on the wafer, profile data for a plurality of locations on the wafer, ~~and~~ or uniformity data for a plurality of locations on the wafer, or a combination of two or more thereof.

7. (Original) The method of claim 2 wherein the feed forward data includes a plurality of locations radially positioned on the wafer.

8. (Original) The method of claim 2 wherein the feed forward data includes a plurality of locations non-radially positioned on the wafer.

9. (Original) The method of claim 1 further comprising:

examining a real-time response of the wafer and the hotplate;

estimating wafer stresses using the real-time response; and

creating a thermal model for a gap between the wafer and the hotplate, wherein a thermal response for the gap is predicted based on the estimated wafer stresses; and

incorporating the thermal model for the gap into the dynamic thermal model of the system.

10. (Currently Amended) The method of claim 1 further comprising:

estimating wafer warpage; ~~and~~

creating a thermal model for a gap between the wafer and the hotplate, wherein a thermal response for the gap is predicted based on the estimated wafer warpage; and

incorporating the thermal model for the gap into the dynamic thermal model of the system.

11. (Original) The method of claim 1 further comprising:

modeling a thermal interaction between the zones of the hotplate; and

incorporating the model of the thermal interaction into the dynamic thermal model of the system.

12. (Original) The method of claim 1 further comprising:

creating a virtual sensor for estimating a temperature for the wafer; and

incorporating the virtual sensor into the dynamic thermal model of the system.

13. (Original) The method of claim 1 further comprising:

modeling a thermal interaction between the hotplate and an ambient environment; and

incorporating the model for the thermal interaction into the dynamic thermal model of the system.

14. (Original) The method of claim 1 further comprising:

creating a diffusion-amplification model of a resist carried by the wafer; and

incorporating the diffusion-amplification model into the dynamic thermal model of the system.

15. (Original) The method of claim 1 further comprising:

creating a variation vector D, wherein the variation vector comprises differences between measurement data and a desired value;

parameterizing at least one nominal setpoint into a vector R comprising at least one intelligent setpoint;

creating a sensitivity matrix using the dynamic thermal model; and

determining the at least one intelligent setpoint by solving an optimization problem comprising

$$\min_{r} \|D - \alpha \cdot MR\|,$$

wherein $r_{min} < r < r_{max}$, R is the vector comprising the at least one intelligent setpoint, M is the sensitivity matrix, α is a proportionality constant relating the measurement data to the sensitivity matrix M , and D is the variation vector.

16. (Original) The method of claim 15 further comprising:

updating a recipe with the plurality of intelligent setpoint;

running the updated recipe;

obtaining updated measurement data; and

iterating until a desired uniformity is achieved.

17. (Original) The method of claim 16 wherein the desired uniformity comprises a 3-sigma variation of less than approximately two percent.

18. (Original) The method of claim 17 wherein the desired uniformity comprises a 3-sigma variation of less than approximately one percent.

19. (Currently Amended) The method of claim 15 further comprising:

receiving feed forward data;

obtaining the measurement data from the feed forward data, wherein the measurement data comprises ~~at least one of~~ critical dimension measurements, profile measurements, ~~and~~ or uniformity measurements, or a combination of two or more thereof; and

determining the desired value, wherein the desired value comprises ~~at least one of~~ a desired critical dimension, a desired profile, ~~and~~ or a desired uniformity, or a combination of two or more thereof.

20. (Currently Amended) The method of claim 15 further comprising:

executing a process using a recipe having at least one nominal setpoint for each zone of the hotplate;

obtaining the measurement data from the executed process wherein the measurement data comprises ~~at least one of~~ critical dimension measurements, profile measurements, ~~and~~ or uniformity measurements, or a combination of two or more thereof; and

determining the desired value, wherein the desired value comprises ~~at least one of~~ a desired critical dimension, a desired profile, ~~and~~ or a desired uniformity, or a combination of two or more thereof.

21. (Original) The method of claim 15 further comprising:

making temperature perturbations for each zone of the hotplate; and

establishing the sensitivity matrix M using results of the temperature perturbations.

22. (Original) The method of claim 15, further comprising:

using an instrumented wafer to establish the sensitivity matrix M.

23. (Currently Amended) The method of claim 15 further comprising:

determining a vector D of a thermal dose at each radial element location, wherein

$$D = \begin{bmatrix} d_1 \\ \vdots \\ d_n \end{bmatrix}; \text{ \sout{and}}$$

characterizing perturbations in the thermal dose as

$$\begin{bmatrix} d_1 \\ \vdots \\ d_n \end{bmatrix} = M \begin{bmatrix} r_1 \\ \vdots \\ r_m \end{bmatrix}; \text{ and}$$

determining values of the vector r, such that the vector d removes across wafer variations in the vector D.